(U.S. Patent No. 3,459,565), Elmer et al. (U.S. Patent No. 3,592,619) and Ford (U.S. Patent No. 2,758,937); claims 1, 5, 13, 14, 42-47 and 51-53 under 35 U.S.C. 103(a) over Ellis (U.S. Patent No. 3,430,397) in view of Zeinetz, further in view of Williams or Blaha, and further in view of Jones, Elmer and Ford; and claims 23, 27, 29-31, 37, 54-59 and 63-66 under 35 U.S.C. 103(a) over Ellis in view of Zenitezt, further in view of Williams or Blaha, and further in view of Jones, Elmer and Ford, and further in view of Gray. These rejections are respectfully traversed.

The Examiner is respectfully requested to once again refer to Applicant's Declaration ("the Macedo Declaration") submitted May 2, 2007 in support of the Applicant's remarks presented below.

Neither MacKenzie nor any of the other applied references, taken alone or in combination, disclose or even suggest a prestressed foam glass tile wherein, *inter alia*, the tile has a compression strength of 10,000 psi or greater prior to being in a prestressed condition and a prestress compression of 4,000 psi or greater, as recited in claim 1, and as similarly recited in claims 23, 42 and 54.

MacKenzie discloses two products: a) foamed glass and b) pressed product: "The products of the method can be made in the form of foamed glass or in the form of pressed products such as tiles, bricks and the like." See col. 2, lines 38-40 of MacKenzie. As discussed in further detail below, MacKenzie only applies "prestressing" to the pressed product, not to the foamed glass.

It is important to define prestressing when comparing MacKenzie's patent to the current patent application. In civil engineering, the meaning of "prestressed" is to apply

a compression stress to a ceramic like concrete or glass while in use so that one can transfer some of the compressional strength to tensile strength in order to condition it to withstand its working load more effectively or with less deflection[1]. In Example 7 of the current patent application, the foamed glass has a compressional strength of 14,600 psi and a tensile strength of 2,500 psi. Using this as an example, if one applies 6,000 psi of compression to the tile during application (use), it will then have a compressional strength of 8,600 psi (=14,600 – 6,000) and a tensile strength of 8,500 psi (=2,500 + 6,000). However, if one removes the stress as described in MacKenzie, the strength would come back to the original compressional strength of 14,600 psi and tensile strength of 2,500 psi. There is no prestressing according to the civil engineering definition (applied in use vs. in making) in MacKenzie's patent examples. Therefore, MacKenzie does not teach a prestressed foam glass tile.

Further, regarding the foamed glass product of MacKenzie, MacKenzie states the following:

> In the event that a foamed glass product is desired the treating agent acts as a foaming agent and the usual treating parameters are a temperature of about 600°-900°C and about atmospheric pressure. The treating agent is activated at the treating temperature and pressure to cause the softened glass to expand. The extent of foaming depends on the concentration of treating agent, and treating temperature, pressure and residence time.

See col. 5, line 60 - col. 6, line 1 of MacKenzie. Note that the treatment referred to in MacKenzie is done at "atmospheric pressure" as stated above. Atmospheric pressure (or barometric pressure) as related to architecture can be defined as" "The pressure exerted by the earth's atmosphere; under standard conditions equal to 14.7 lb per sq in. (1.01 ×

[1] http://www.answers.com/topic/prestress, http://www.merriam-webster.com/dictionary/prestress

10^6 pascals) equivalent to the pressure exerted by a column of mercury 29.9 in. (76.0 cm) high," or more simply, "The pressure caused by the weight of the air above a given point."[2] Therefore, it is clear that the pressure referenced in conjunction with MacKenzie's foamed glass is not related to the civil engineering definition of "prestressing" in any way, nor to the prestressed foam glass of the current patent application.

> Regarding the pressed product of MacKenzie, MacKenzie states the following:
>
> When a pressed product is desired, pressing of the mix during heat treating is effected to coalesce the filler (treating agent) with the glass particles and weld the glass and filler into a unitary mass, in some instances with the particles thereof still retaining their relative positions. After cooling to below the solidification point thereof, a hard finished pressed product in the nature of a tile, brick, sheet or the like is obtained. For such purposes, the pressing can be at up to about 10,000 psi or more, and can be carried out in any suitable means, such as through the use of a movable cover pressed downwardly under hydraulic pressure within a mold in which the mix is heat treated.

See Col. 6, lines 10-23 of MacKenzie. Note that the pressed product has pressure applied during heat treating as quoted above, but not during the application or use of the product. Thus this does not follow the civil engineering definition of prestressing as described with reference to the present patent application.

MacKenzie's Example 1 describes preparing foamed glass with three runs. See col. 6, line 50 – column 8, line 15 of MacKenzie. The first run results are described in col. 7, lines 16-33 as follows:

> The resulting mixture of particulate used-container glass and particulate heat treated animal excreta product is passed into an open topped mold and is heated therein to about 975°C and is held at about that temperature for about 1 hour, to foam the mixture to approximately 350 percent of its original volume and reduce

[2] http://www.answers.com/topic/atmospheric-pressure

> the density thereof to about 0.25 gm/cc. During foaming, the particles of glass soften (but do not melt), expand and weld together to provide a unitary foamed product. Thereupon, the foamed product is allowed to cool over about 1 hour to room temperature and the mold is stripped therefrom. The finished product has a unique, dark, mottled appearance with an average reflectance of about 25 percent, and tensile strength of about 150 psi. It is useful as a structural and decorative material, can be sawed, drilled, ground or otherwise worked, and is resistant to water, chemicals and wear.

As explained and expected from earlier comments, no reference to applied pressure is stated in the above description. The product as stated above has a density of 0.25 gm/cc, equating to 15 PCF and a tensile strength of about 150 psi. This foamed glass is not prestressed nor is it very strong; it is much weaker than foamed glass of the claimed invention.

MacKenzie's second run is described (in part) at col. 7, lines 51-60 as follows:

> Such treating agent is used in a concentration of about 8 lbs. Heat treating of the mix is effected at about 875 for about 30 minutes at about atmospheric pressure and the surface of the foamed glass product is smoothed mechanically before cooling of the product to below its solidification point. The finished product is of a distinctive, multi-colored hue, metallic inclusions being clearly visible therein. It has a density of 0.4 gm/cc and is useful for the same purposes as the product of the first run."

Again, the atmospheric pressure mentioned above does not relate to prestressing.

MacKenzie's third run is described (in part) at col. 8, lines 9-14 as follows:

The heat treating temperature of the mix is 900°C and residence time 20 minutes at atmospheric pressure. A low melting glaze is added to the heat treated product before cooling thereof. Comparable results are obtained to those of the previous runs, except that the density of the product is greater, namely, 0.5 gm/cc.

In the description above, "atmospheric pressure," not prestressing is detailed. The density of 0.5 gm/cc, equating to about 31 PCF is the most dense of the foam glass produced without pressure (or at atmospheric pressure), further confirming that

MacKenzie's definition of foam glass has no pressure (in the sense of prestressing) applied during processing or application.

MacKenzie's Example II also has three runs, overall the 4th, 5th, and 6th run, for the pressed product as described at col. 6, lines 10 – 15 as follows:

> When a pressed product is desired, pressing of the mix during heat treating is effected to coalesce the filler (treating agent) with the glass particles and weld the glass and filler into a unitary mass, in some instances with the particles thereof still retaining their relative positions.

Thus, the pressed product of MacKenzie is made up of solid excreta cooked at high pressure and does not include gas bubbles. That is, the pressed product of MacKenzie is not foamed glass.

The forth run is described (in part) at col. 8, line 49-60 as follows:

> The heat treating of the mix is carried out at 900°C and at an increased pressure of about 1000 psi over a residence time of about 2 minutes, after which the pressed product is cooled over 1 hour to room temperature and recovered as a hard, smooth, strong, slate-like product having a tensile strength of about psi and a density of 1.9 gm/cc. Such product is non-flammable, capable of withstanding thermal shock and is inexpensive and durable. It has a distinctive dark, mottled appearance with an average reflectance of 10 percent. It is useful as roofing material, floor and wall tile, artificial slate and artificial marble.

In the description above, specifically line 55 in Col. 8, the density is 1.9 gm/cc. This equates to approximately 118 PCF. The strength date is not given (no numerical data present). By MacKenzie's definition, this is not a foamed glass; it is a "pressed product." It is also not a prestressed product by the civil engineering definition.

MacKenzie's fifth run is described at col. 8, line 61 – col. 9, line 16 as follows:

> In a fifth run, the procedure and parameters of the fourth run are followed, except that the treating agent comprises heat treated excreta prepared by heating dried particulate human excreta to 600°C and holding if for 30 minutes within a closed system while removing volatiles there from. The solid residue has the following

> approximate composition...The treating agent is used in 50 lb. amount in the mix. Moreover, the heat treating temperature of the mix is 800°C, pressure is 2,000 psi and residence time is 5 minutes. Before cooling is effected, ferric oxide powder is sprinkled on surfaces of the glass product and the product is pressed again at 1,000 psi for about 1 minute. The finished product obtained after cooling has a tensile strength of 6,000 psi, density of 2.0 gm/cc...

The density, as mentioned above, specifically at col. 9, line 16, is 2.0 gm/cc, which equates to about 124 PCF. The tensile strength is 6,000 psi. Again, by MacKenzie's definition, this is not a foamed glass; it is a "pressed product." It is also not a prestressed product by the civil engineering definition.

MacKenzie's sixth run is described in col. 9, lines 37-43 as follows:

> ...pressure 500 psi, and residence time 20 minutes. Moreover, before cooling, the pressed product is bonded to a clear glass sheet under 500 psi pressure and 700°C temperature to provide a finished product with 70 percent average reflectance, 5,000 psi tensile strength and 2.1 gm/cc density.

The density, as mentioned above, specifically at col. 9, line 43, is 2.1 gm/cc, which equates to about 130 PCF. The tensile strength is 5,000 psi. Again, by MacKenzie's definition, this is not a foamed glass; it is a "pressed product." It is also not a prestressed product by the civil engineering definition.

Regarding the Grady and Ellis patents, by the Examiner's own admission, those references do not disclose a foam glass tile. *See also* Macedo Declaration, par. 6. In an effort to combine with other references to obtain a foam glass tile under prestress compression, the Examiner notes that "Zeinetz teaches utilization of foamed glass tiles or blocks within a tensioned structural arrangement," *id.* However, it is respectfully submitted that the Examiner's position is erroneous. Zainetz does not teach the prestressing of a foam glass tile. *See* Macedo Declaration, par. 7.

To support his position that the Zeinetz '316 Patent discloses prestressing of a foam glass material, the Examiner points to tension bars 36, 39 in FIG. 11 of the Zeinetz '316 Patent and asserts that these tension members hold foam glass tiles, citing Col. 4, lines 5-9 of the Patent. *See id.* at 3. However, contrary to the Examiner's assertion, FIG. 11 does not teach or even suggest the prestressing of a foam glass tile under any amount of prestress compression. *See* Macedo Declaration, par. 8.

The Zeinetz '316 Patent is directed to a roof structure, as shown in FIGS. 1 and 2 of the Patent. In conjunction with FIG. 5, the Zeinetz '316 Patent further teaches that the seam 19, 119, 21 and 121 is adapted to fit the abutting lateral edge portions of adjacent roof elements (*e.g.*, a1, a2, b2, c1, c2, and d in FIG. 5). *See* Zeinetz '316 Patent, Col. 3, lines 1-7. FIG. 11 illustrates the section of FIG. 5 along the line B--B and represents "coupling means" for abutting roof elements. *Id.*, Col. 2, lines 4-6 (emphasis added). In fact, the Zeinetz '316 Patent explicitly describes the tension bars 36 and 39 in FIG. 11 as "a locking means for use in connection with a U-shaped or tubular seam 19e, 119e, 21e and 121e." *Id.*, Col. 3, line 73 - Col. 4, line 4. In other words, the tension bars 36 and 39 in FIG. 11 are merely coupling or connecting means in conjunction with the U-shaped/tubular seam 19, 119, 21, 121 to keep adjacent roof elements together. Nowhere in the Zeinetz '316 Patent is there any teaching or suggestion that the tension bars 36, 39 in FIG. 11 to which the Examiner points are the means for prestressing foam glass tiles, let alone providing prestress compression of 4,000 psi or greater. *See* Macedo Declaration, par. 8.

It is also noted that the Zeinetz '316 Patent teaches that the rows of interengaging profiles 19, 119, 21, 121 which keep each roof element in wedged engagement with the adjacent elements may render possible the "prestressing of the shell of the cupola." Zeinetz '316 Patent, Col. 3, lines 7-17. As supported by the Macedo Declaration, it would be clear to those skilled in the art that such "prestressing of the shell of the cupola" only refers to providing a structural support to a dome by keeping all the roofing elements together in wedged engagement, hence "self-supporting roof" as the title of the Zeinetz '316 Patent. However, this is different from the prestressing as applied to foam glass tiles to strengthen them in accordance with the present invention. *See* Macedo Declaration, par. 9; *see also* EDWARD G. NAWY, PRESTRESSED CONCRETE: A FUNDAMENTAL APPROACH 8-10 (1989) (defining prestressing as used in the present application). Accordingly, one skilled in the art would understand that the "prestressing of the shell of the cupola" arising from wedged engagement of neighboring roof elements as suggested by the Zeinetz '316 Patent does not refer to the kind of prestressing applied to foam glass tiles as claimed in the present application and therefore does not render the claimed prestressed foam glass tile obvious. *See* Macedo Declaration, par. 9. Furthermore, one skilled in the art would also understand that the wedged engagement with neighboring elements as shown in the Zeinetz '316 Patent cannot possibly provide a prestress compression of 4,000 psi or greater. *See* Macedo Declaration, par. 9. Therefore, it is respectfully submitted that the Zeinetz '316 Patent does not teach or even suggest at all the prestressing of a foam glass tile under a prestress compression of 4,000 psi or greater as required by all of the pending claims.

Moreover, the Zeinetz '316 Patent teaches a litany of roofing materials that could be used, including glass, wood, synthetic plastic, concrete, porous concrete, foamed plastic, foamed glass, cardboard, sheet metal, wool, cork and fiber board. These materials are used in a multi-layer structure where each layer is for a different purpose such as a "moisture-insulating layer" consisting of a "heat insulating layer," a "load sustaining layer" and a "sound absorbing layer." *See* Zeinetz '316 Patent, Col. 4, lines 8-15. The kind of layer that "foamed glass" may be used for is not taught. However, the load sustaining layer, which is the layer that would potentially be under compression, "is made of concrete, for example." *Id.*, Col. 4, line 14. There is no teaching that the load sustaining layer could be made of prestressed foam glass tiles as required by all the claims, let alone foam glass tiles having a prestress compression of 4,000 psi or greater as required by the rejected claims. *See* Macedo Declaration, par. 10.

Another reason why the Examiner fails to establish a *prima facie* case of obviousness with respect to the rejected claims is that the combinations of the prior art references that the Examiner relies on do not show a reasonable expectation of success in obtaining the claimed subject matter set forth in the rejected claims for one of ordinary skill in the art. *See In re Vaeck*, 947 F.2d 488, 493 (Fed. Cir. 1991); *Amgen, Inc. v. Chugai Pharm. Co.*, 927 F.2d 1200, 1207-08 (Fed. Cir. 1991); *In re Rinehart*, 531 F.2d 1048, 1053-54 (C.C.P.A. 1976); *see also* MANUAL OF PATENT EXAMINING PROCEDURE § 2143.02 (8th ed. 2006). In this regard, the Examiner further supports the rejection by stating that "[a]pplying a pre-compressive force of from 1,000 to 5,000 psi to the resulting assembled foam glass units, thus affording as much recovery from the effects of

a greater degree of overload, would have constituted a further obvious expedient to one having ordinary skill in the art at the time the invention was made." However, one of ordinary skill in the art would not have any reasonable expectation of success in achieving a prestress compression of 4,000 psi or greater in a prestressed foam glass tile by combining the prior art references relied upon by the Examiner, since, as discussed above, none of the prior art discloses or even suggests the prestressing of a foam glass tile under any amount of a prestress compression, let alone a prestress compression within the claimed range of 4,000 psi or greater. When the prior art does not teach how to prestress a foam glass tile under any amount of prestress compression, one of ordinary skill in the art would not be reasonably expected to succeed in obtaining the subject matter of the rejected claims, including a prestressed foam glass tile under a prestress compression of 4,000 psi or greater, merely on the basis of the prior art relied upon by the Examiner.

Furthermore, to render an invention unpatentable for obviousness, the prior art must enable one of ordinary skill in the art to make and use the invention. *See In re Kumar*, 418 F.3d 1361, 1368-69 (Fed. Cir. 2005); *see also KSR Int'l Co. v. Teleflex Inc.*, No. 04-1350, slip op. at 13 (U.S. Apr. 30, 2007) ("[I]f a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill." (emphasis added)). Accordingly, even if a *prima facie* case of obviousness is deemed made with respect to the rejected claims on the basis of, *inter alia*, the Zeinetz '316 Patent, which Applicant contends it cannot, such

case still fails in any event because neither prior art reference would enable one of ordinary skill in the art to make a prestressed foam glass tile having a prestress compression within the claimed range of 4,000 psi or greater. *See In re Kumar*, 418 F.3d at 1368 ("[W]hen a *prima facie* case of obviousness is deemed made based on similarity to a known composition or device, rebuttal may take the form of evidence that the prior art does not enable the claimed subject matter."); *id.* at 1369 ("To render a later invention unpatentable for obviousness, the prior art must enable a person of ordinary skill in the field to make and use the later invention."); *In re Payne*, 606 F.2d 303, 314-15 (C.C.P.A. 1979) ("[T]he presumption of obviousness based on close structural similarity is overcome where the prior art does not disclose or render obvious a method for making the claimed compound.").

None of the prior art relied upon by the Examiner, including the Zeinetz '316 Patent, provides any disclosure (by way of prestress compression measurements, for example) or cite to any supporting reference that would enable one of ordinary skill in the art to prestress a foam glass tile under any amount of prestress compression, let alone the claimed range of 4,000 psi or greater. Accordingly, even if a *prima facie* case of obviousness is deemed made based on the prior art, it is rebutted. *See In re Kumar*, 418 F.3d at 1368-69. Accordingly, based on the foregoing reason alone, Applicant respectfully requests that the rejection of the claims made by the Examiner be withdrawn.

The Examiner also takes the position that either the Williams Patent or the Blaha Patent suggests a foam glass tile having a compression strength of 10,000 psi or greater,

as required by the rejected claims. However, it is respectfully submitted that the Examiner's position is again erroneous. Neither reference teaches or suggests a foam glass tile having a compression strength within the claimed range of 10,000 psi or greater. *See* Macedo Declaration, par. 15.

The Examiner does not dispute that none of the prior art relied upon by him discloses the claimed range of compression strength required by the rejected claims. In fact, the Examiner does not point to any portion of the prior art that discloses a foam glass tile having a compression strength of 10,000 psi or greater, because nowhere in the prior art is there any such disclosure. Rather, in support of the rejection, the Examiner merely points to the portions of the Williams Patent and the Blaha Patent disclosing the ranges of compression strength that do not overlap with and do not come close to the claimed range of 10,000 psi or greater required by the rejected claims. *See id.* at 3-4 & 11.

More specifically, the Examiner points to the following portion of the Williams Patent: "Such a material should be readily available, easily formed in lengths up to 100 feet, be able to withstand a stress of 5,000-8,000 psi . . ." Williams 'Patent, Col. 1, lines 36-38 (emphasis added). This disclosed range falls short of and does not overlap at all with the claimed range of compression strength of a foam glass tile starting from 10,000 psi and higher as required by the rejected claims. This difference in compression strength is substantial. *See* Macedo Declaration, par. 16.

Moreover, Williams' Patent does not even disclose "foam glass tiles," let alone "prestressed foam glass tiles" as required by the present claims. Indeed, the following

portion of the Williams Patent cited by the Examiner in support of his position is the evidence: "In such form, the foamed glass product can be used as a structural member in a number of industries including the housing industry as a bearing member . . . ." Williams Patent, Col. 1, lines 19-22 (emphasis added). However, "such form" in the cited portion of the Williams Patent refers to a "foamed glass" produced "in the form of elongate members, more particularly in the form of hollow elongate cylinders" as recited in the sentence in the Williams Patent just before the cited portion. Hence, it is clear that the Williams Patent is directed to an elongate structure of foam glass rather than foam glass tiles as in the present invention. In fact, the description of the preferred embodiment of the Williams Patent is directed to production of foam glass in the form of hollow elongate cylinders so that it can be used as conduit such as sewer pipe, telephone pole, or power line. *See* Williams Patent, Col. 1, lines 14-25 & FIG. 3. However, as supported by the Macedo Declaration, those skilled in the art would understand that, unlike in the case of foam glass tiles, prestressing of these foam glass hollow elongate cylinders to be used as conduit, telephone poles, etc. would not be desirable, nor is it technically feasible or economical. *See* Macedo Declaration, par. 17. Accordingly, one of ordinary skill in the art would not be motivated to apply prestressing to a foam glass product described in the Williams Patent, but in fact would be taught away from doing so.

Similarly, the Examiner points to a portion in the Blaha Patent disclosing a slab of cellular, agglomerated material having a compression strength "in excess of 1200 pounds per square inch." Blaha Patent, Col. 3, lines 26-28. The compression strength of 1,200

psi as disclosed by the Blaha Patent falls far short of 10,000 psi, the lower end of the claimed range of compression strength required by the rejected claims.

To overcome this apparent discrepancy, the Examiner further relies on a vague statement of objective taken from another different portion of the Blaha Patent that the cellular material is to be "sufficiently strong to be used for structural purposes" to support his position. However, such open-ended statement alone, without any adequate enabling disclosure, cannot enable one of ordinary skill in the art to achieve, with a reasonable expectation of success, the dramatic increase in compression strength of a foam glass tile from a mere 1,200 psi as disclosed by the Blaha Patent to over 10,000 psi required by the rejected claims. *See* Macedo Declaration, par. 18. Moreover, this statement does not teach that the resulting material can or should be prestressed. Simply put, the Blaha Patent does not teach or suggest at all a foam glass tile having a compression strength within the claimed range of 10,000 psi or greater, let alone a prestressed foam glass tile with the claimed compression strength and prestress compression.

To establish a prima *facie* case of obviousness of a claimed invention under 35 U.S.C. § 103, **all** the claim limitations must be taught or suggested by the prior art. *See CFMT, Inc.*, 349 F.3d at 1342; *In re Royka*, 490 F.2d at 985; *see also* MANUAL OF PATENT EXAMINING PROCEDURE § 2143.03 (8th ed. 2006). However, as shown above, none of the prior art relied upon by the Examiner, including the Williams Patent and the Blaha Patent, teaches or suggests the claimed range of compression strength of a foam glass tile, 10,000 psi or greater, prior to being in a prestressed condition which is one of

the limitations of the rejected claims. Since the Examiner fails to establish a *prima facie* case of obviousness of the claims over the prior art under 35 U.S.C. § 103(a), Applicant is entitled to allowance of these claims. *See In re Oetiker*, 977 F.2d at 1445.

Another reason why the Examiner fails to establish a *prima facie* case of obviousness is that there is no suggestion or motivation to combine the prior art. *See In re Rouffet*, 149 F.3d 1350, 1358 (Fed. Cir. 1998); *see also* MANUAL OF PATENT EXAMINING PROCEDURE § 2143.01 (8th ed. 2006).

The Supreme Court held recently in *KSR Int'l Co. v. Teleflex Inc.*, No. 04-1350, slip op. at 14-15 (U.S. Apr. 30, 2007) that "it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does." While warning against applying as a rigid rule, the Court found that this is a "helpful insight." *Id.* at 14. The Court in *Teleflex* further held:

> Often, it will be necessary for a court to look to interrelated teachings of multiple patents, the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue. ***To facilitate review, this analysis should be made explicit.*** See *In re Kahn*, 441 F.3d 977, 988 (CA Fed. 2006) ("***[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.***"). As our precedents make clear, however, the analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the

> inferences and creative steps that a person of ordinary skill in the art would employ.

Id. at 14 (emphasis added).

It is respectfully submitted that the Examiner's position that the combination of either the Williams Patent or the Blaha Patent with the other cited prior art renders the rejected claims obvious is erroneous since there exists no apparent reason to combine the prior art to obtain a prestressed foam glass tile having, *inter alia*, both a compression strength of 10,000 psi or greater prior to being in the prestressed condition and a prestress compression of 4,000 psi or greater. Other than a mere hindsight-based contention using the invention as a roadmap to find its prior art components, the Examiner provides no actual evidence of reason for the prior art combination.

Nowhere in the Williams Patent, or the Blaha Patent, or any other prior art relied upon by the Examiner is there any explicit or even implicit suggestion or motivation for the prior art combination to render the claimed ranges of prestress compression and compression strength obvious. The Examiner does not make any contrary contention, nor does he provide an actual evidence that shows reason for such prior art combination.

Instead, the Examiner relies on two cases, *In re Preda*, 401 F.2d 825, 826 (C.C.P.A. 1968), and *In re Sernaker*, 702 F.2d 989, 994-95 (Fed. Cir. 1983), to support the prior art combination. *See* September 11, 2006 Office Action at 11. However, it is respectfully submitted that the Examiner's reliance on these cases is misplaced, even under the flexible and expansive approach recently set forth by the Supreme Court in *Teleflex*. Neither case supports the Examiner's position that a reason for combining the prior art can be found.

The Court of Customs and Patent Appeals in *In re Preda* cited by the Examiner held that "in considering the disclosure of a reference, it is proper to take into account not only specific teachings of the reference but also the inferences which one skilled in the art would reasonably be expected to draw therefrom." *In re Preda*, 401 F.2d at 826. However, when none of the prior art relied upon by the Examiner discloses a prestressed foam glass tile having any amount of prestress compression, let alone the claimed range of 4,000 psi or greater and, furthermore, when none of the prior art relied upon by the Examiner discloses a foam glass tile having a compression strength within the claimed range of 10,000 psi or greater, no one skilled in the art would reasonably be expected to draw from the prior art combination an inference that the claimed ranges of compression strength prior to being in a prestressed condition and prestress compression in a prestressed foam glass tile as set forth in the rejected claims would be desirable.

The Examiner also takes the position, citing *In re Sernaker*,[3] that "[t]he strongest rationale for combining references is a recognition, expressly or impliedly in the prior art or drawn from a convincing line of reasoning based on established scientific principles or legal precedent, that some advantage or expected beneficial result would have been produced by their combination." September 11, 2006 Office Action at 11. The Examiner

[3] However, the cited portion of *In re Sernaker* does not appear to provide any direct support for the Examiner's statement in support of which he cites the case. Instead, the Federal Circuit in *In re Sernaker* set forth the following tests for obviousness: "(a) whether a combination of the teachings of all or any of the references would have suggested (expressly or by implication) the possibility of achieving further improvement by combining such teachings along the line of the invention in suit, and (b) whether the claimed invention achieved more than a combination which any or all of the prior art references suggested, expressly or by reasonable implication." *In re Sernaker*, 702 F.2d at 994. After finding that the Patent Office Board of Appeals failed these tests, the Federal Circuit held that the Board did not correctly deduce obviousness from the combination of four references. *See id.* at 994-96. Similarly in the present case, the Examiner's rejection based on the prior art combination would fail these tests because of the reasons set forth in this Reply.

does not, however, explain what specific recognition or technological principle within the knowledge of one of ordinary skill in the art would motivate one with no knowledge of the present invention to make the combination of the prior art to obtain a prestressed foam glass tile having both a prestress compression within the claimed range of 4,000 psi or greater and a compression strength prior to being in a prestressed condition within the claimed range of 10,000 psi or greater. *See also In re Rouffet*, 149 F.3d at 1357-58 ("Because the Board did not explain the specific understanding or principle within the knowledge of a skilled artisan that would motivate one with no knowledge of [the] invention to make the combination, this court infers that the examiner selected these references with the assistance of hindsight. This court forbids the use of hindsight in the selection of references that comprise the case of obviousness.").

In sum, lacking the showing of a reason for combining the references, such as a motivation to combine references, the Examiner has not shown a *prima facie* case of obviousness of the claims over the prior art. *See id.* at 1358. Accordingly, Applicant is entitled to allowance of these claims. *See In re Oetiker*, 977 F.2d at 1445.

Even though, as discussed above, it is not disputed that none of the prior art relied upon by the Examiner discloses the range of compression strength of a foam glass tile that either overlaps with or is even close to the claimed range of compression strength required by the rejected claims, the Examiner nevertheless maintains the rejection by relying on two fairly old cases from the U.S. Court of Appeals for the Seventh Circuit, *Hobbs v. Wisconsin Power & Light Co.*, 250 F.2d 100, 107-08 (7th Cir. 1957), and *Brunswick Corp. v. Champion spark Plug Co.*, 689 F.2d 740, 750 (7th Cir.

1982).[4] *See* September 11, 2006 Office Action at 12. However, it is respectfully submitted that the Examiner's reliance on these cases is misplaced.

The Seventh Circuit in *Hobbs* held:

> [A] change of degree is not patentable . . . . It is . . . true that the mere carrying forward of the original thought with a change only in form, proportion or degree, in doing the same thing the same way by substantially the same means, but with better results, is not such invention as will sustain the patent. But where different concepts, purposes and objects are involved, as we understand the law, this rule is not always to be arbitrarily applied, and when different means are employed, followed by success where failure theretofore existed, there is no basis for the application of the rule.

Hobbs, 250 F.2d at 107-08 (emphasis added) (citations and internal quotation marks omitted). As applied to the present case, there is no dispute that none of the prior art relied upon by the Examiner discloses a foam glass tile having a compression strength within the claimed range of 10,000 psi or greater as required by the rejected claims. As supported by the Macedo Declaration, one of ordinary skill in the art would understand that none of the means disclosed in the prior art relied upon by the Examiner can possibly achieve the compression strength of 10,000 psi or greater in a foam glass tile. *See* Macedo Declaration, par. 15. On the other hand, with the means disclosed in the incorporated co-pending application of Applicant (Application Serial No. 10/625,071), a foam glass tile having the previously unattainable compression strength of 10,000 psi or greater can be achieved by those skilled in the art. *See* Macedo Declaration, par. 19.

[4] The Examiner also relies on these Seventh Circuit cases in support of his position that the disclosures by the Zeinetz '316 Patent and the Lagendijk '656 Patent render the claimed range of prestress compression (4,000 psi or greater) obvious to one of ordinary skill in the art. *See* September 11, 2006 Office Action at 12. However, the Examiner's reliance is misplaced since, as discussed above, neither the Zeinetz '316 Patent nor the Lagendijk '656 Patent discloses any amount of prestress compression for a prestressed foam glass tile, let alone the claimed range of prestress compression of 4,000 psi or greater.

Therefore, the claimed range of compression strength is much more than simply "a change of degree" in the property of the prior art foam glass tile. There is no basis for the Examiner's application of *Hobbs* to render the claimed range of compression strength obvious in view of the prior art.

The Seventh Circuit in another case cited by the Examiner, *Brunswick Corp.*, held that making something merely stronger than the prior art, merely changing material if the properties of the material are known and expected, or merely substituting a superior material for another in an existing product is not patentable. *See Brunswick Corp.*, 689 F.2d at 750. However, the court also noted an exception to that reasoning when unexpected results or properties are involved. *See id.* at 750-51 (citing *Tracor, Inc. v. Hewlett-Packard Co.*, 519 F.2d 1288 (7th Cir. 1975)). Accordingly, the Examiner's arbitrary application of *Brunswick Corp.*, without any further analysis, is inapposite.

In fact, the Federal Circuit has held that even when there is a presumption of obviousness based on a claimed invention that falls within a range disclosed by the prior art, such presumption can be rebutted if the prior art teaches away from the claimed invention, or if there are new and unexpected results relative to the prior art. *See Iron Grip Barbell Co. v. USA Sports, Inc.*, 392 F.3d 1317, 1322 (Fed. Cir. 2004); *see also* MANUAL OF PATENT EXAMINING PROCEDURE 2144.05 (III) (8th ed. 2006). The Supreme Court also relied on the principle that "when the prior art teaches away from combining certain known elements, discovery of a successful means of combining them is more likely to be nonobvious," and found that "the fact that the elements worked together in an unexpected and fruitful manner supported the [non-obviousness]

conclusion . . . ." *KSR Int'l Co. v. Teleflex Co.*, No. 04-1350, slip op. at 12 (U.S. Apr. 30, 2007) (citation omitted).

Accordingly, even if a *prima facie* case of obviousness is deemed made on the basis of the range of compression strength disclosed by the Williams Patent or the Blaha Patent, which Applicant contends it cannot in view of the lack of overlap with the claimed range, such case still fails in any event because the range of compression strength disclosed by the prior art would teach away one of ordinary skill in the art from the claimed invention set forth in the rejected claims. More specifically, the range of compression strength of foam glass product disclosed by the prior art would teach away one of ordinary skill in the art from prestressing the foam glass product under a prestress compression within the claimed range of 4,000 psi or greater.

As supported by the Macedo Declaration, it is well known to one of ordinary skill in the art that by applying prestressing, the resulting compression strength of the prestressed product will decrease by the prestress amount while the resulting tension strength will increase by the same amount. It is also well understood by one of ordinary skill in the art that the optimum amount of prestress level is set by making the tension strength comparable to the compression strength as the result of prestressing. In other words, the optimum prestress level is one half of the difference between the compression strength and the tension strength under non-prestressed condition. *See* Macedo Declaration, par. 20; *see also generally* EDWARD G. NAWY, PRESTRESSED CONCRETE: A FUNDAMENTAL APPROACH 8-13 (1989). Based on these principles, Dr. Macedo in his Declaration finds that the optimum prestress level for the foam glass tiles described in

TABLE 1 of the present application is calculated to be approximately 44% of the compression strength of the foam glass tile prior to being in the prestressed condition. For example, for a foam glass tile having a compression strength of 10,000 psi prior to being in a prestressed condition, the corresponding optimum prestress compression is approximately 4,400 psi; for the one having a compressional strength of 12,500 psi prior to being in a prestressed condition, the corresponding optimum prestress compression is approximately 5,500 psi, etc. *See* Macedo Declaration, par. 20.

None of the prior art relied upon by the Examiner discloses the range of compression strength of a foam glass tile that reaches anywhere near 10,000 psi. At best, the greatest amount of compression strength disclosed by the prior art is 8,000 psi, which is casually mentioned by the Williams Patent, without any enabling disclosure, for an elongated tube, not a foam glass tile.[5] Based on the principles discussed above, for a foam glass tile having 8,000 psi, as supported by the Macedo Declaration, one of ordinary skill in the art would estimate that the corresponding optimum prestress compression would be about 44% of 8,000 psi, or 3,500 psi. *See* Macedo Declaration, par. 21.

Accordingly, even assuming that the Williams Patent had provided enabling disclosure for one of ordinary skill in the art to achieve a foam glass tile having a compression strength of up to 8,000 psi, which Applicant contends that it does not, such person would not apply a prestress compression of more than 3,500 psi in any event, let alone 4,000 psi or greater, to this foam glass tile since that would deviate from the

[5] This difference in structure leads to different geometries which affect the relative strength of the resulting materials.

optimum prestress compression level as understood by him or her. Such person would instead apply a prestress compression of at most 3,500 psi or less, at best, corresponding to what would be an optimum prestress compression based on the compression strength disclosed by the prior art relied upon by the Examiner, including the Williams Patent. *See* Macedo Declaration, par. 21.

Accordingly, even if a *prima facie* case of obviousness is deemed made based on, *inter alia*, the range of compression strength of a foam glass material disclosed by the Williams Patent or the Blaha Patent, contrary to Applicant's contention, such case is rebutted in any event by the fact that the prior art range of compression strength teaches away one of ordinary skill in the art from applying a prestress compression of 4,000 psi or greater to a foam glass tile as required by the rejected claims. Hence, based on the foregoing reason, it is respectfully requested that the rejection of the claims by the Examiner be withdrawn.

Furthermore, to render an invention unpatentable for obviousness, the prior art must enable one of ordinary skill in the art to make and use the invention. *See In re Kumar*, 418 F.3d at 1368-69; *see also KSR Int'l Co. v. Teleflex Inc.*, No. 04-1350, slip op. at 13 (U.S. Apr. 30, 2007) (finding that obviousness of a technique requires that its actual application be within the skill of a person of ordinary skill in the art). Accordingly, even if a *prima facie* case of obviousness is deemed made with respect to the rejected claims based on the teachings of the Williams Patent or the Blaha Patent, which Applicant contends that it cannot, such *prima facie* case is rebutted because neither prior art reference would enable one of ordinary skill in the art to make a foam glass tile having a

compression strength within the claimed range of 10,000 psi or greater. *See id.* at 1368 ("[W]hen a *prima facie* case of obviousness is deemed made based on similarity to a known composition or device, rebuttal may take the form of evidence that the prior art does not enable the claimed subject matter."); *id.* at 1369 ("To render a later invention unpatentable for obviousness, the prior art must enable a person of ordinary skill in the field to make and use the later invention."); *In re Payne*, 606 F.2d at 314-15 ("[T]he presumption of obviousness based on close structural similarity is overcome where the prior art does not disclose or render obvious a method for making the claimed compound.").

The Williams Patent does not provide any disclosure (by way of compression strength measurements, for example) or cite to any supporting reference that would enable one of ordinary skill in the art to achieve a foam glass tile having a compression strength of 10,000 psi or greater as required by the rejected claims, let alone the elongated tube having a length of up to 100 feet and a compression strength of up to 8,000 psi, which the Williams Patent casually mentions without any support. *See* Williams '365 Patent, Col. 1, lines 14-25 and 36-38. As supported by the Macedo Declaration, such feat would be considered impossible even with today's foam glass technology, let alone in 1978, the issue date of the Williams Patent. *See* Macedo Declaration, par. 22.

In fact, as supported by the Macedo Declaration, to one skilled in the art, such claim by the Williams Patent would appear inconsistent with its later description of elongate foamed ceramic products made under the procedure it teaches. *See* Macedo

Declaration, par. 23. The elongate foamed ceramic product that the Williams Patent teaches how to make has a cellular structure of closed, elongate bubbles with a diameter ranging from 0.01 mm to 1 cm and a length ranging from 2 mm to 5 cm. *See* Williams Patent, Col. 2, lines 19-33. According to the Macedo Declaration, while a small pore size by itself may not be a sufficient condition for a strong foam glass product, it is a necessary condition and a foam glass product having largest bubbles reaching 1 cm and 5 cm in diameter and length, respectively, can never achieve a compression strength as high as 8,000 psi, let alone the claimed range of 10,000 psi or greater, that is sufficiently strong for the purpose of prestress compression within the claimed range. It is also noted that none of the examples described by the Williams '365 Patent has an average pore size less than 1.0 mm. *See, e.g., id.*, Col. 6, lines 62-63 and Col. 8, lines 5-6. None of the examples provides any compression strength data, but one skilled in the art would understand that in view of the bubble sizes reported by the Williams Patent, none of the examples described in the Williams Patent can achieve a compression strength within the claimed range of 10,000 psi or greater. *See* Macedo Declaration, par. 23.

Despite the dubiousness of such feat of achieving a compression strength of up to 8,000 psi, if it would have been possible at all, the Williams Patent is silent on how to go about achieving it. Nowhere in the description of six examples by the Williams Patent is there any indication of the success of such feat. *See* Macedo Declaration, par. 22. Therefore, the Williams Patent, which would not enable one of ordinary skill in the art to reproduce what the Examiner claims it discloses, *i.e.*, a foam glass product having a

compression strength of 8,000 psi, certainly would not enable such person to make a foam glass tile having an even greater compression strength of 10,000 psi or greater.

Similarly, despite the claim of a slab of cellular material having a compression strength "in excess of" 1,200 psi, nowhere in the Blaha Patent is there any disclosure that would enable one of ordinary skill in the art to produce a foam glass tile having a compression strength of even 2,000 psi or 3,000 psi, let alone 10,000 psi or greater as required by the rejected claims.

In summary, even if a *prima facie* case of obviousness is deemed made based on, *inter alia*, the range of compression strength of a foam glass material disclosed by the Williams Patent or the Blaha Patent, which Applicant contends it cannot, such case still fails in any event in view of the fact that neither the Williams Patent nor the Blaha Patent enables one of ordinary skill in the art to produce a foam glass tile having a compression strength within the claimed range of 10,000 psi or greater as required by the rejected claims. Accordingly, based on the foregoing reason, it is respectfully requested that the rejection of the claims by the Examiner be withdrawn.

The Examiner also takes the position that each of the Jones '565 Patent, the Elmer '619 Patent and the Ford '937 Patent discloses foam glass components having a pore size of less than 1.0 mm. However, it is respectfully submitted that the Examiner's position that the combination of any of the Jones '565 Patent, the Elmer '619 Patent and the Ford '937 Patent with the other cited prior art renders those claims obvious is erroneous since there exists no apparent reason to combine the prior art to obtain a prestressed foam glass tile having, *inter alia*, both a prestress compression of 4,000 psi or greater and an

average pore size of 1.0 mm or less. Other than a mere hindsight-based contention using the invention as a roadmap to find its prior art components, the Examiner provides no actual evidence of reason for the prior art combination. As discussed above, while not a rigid rule, "it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does," and it is a "helpful insight." *KSR Int'l Co. v. Teleflex Inc.*, No. 04-1350, slip op. at 14-15 (U.S. Apr. 30, 2007).

Nowhere in the Jones '565 Patent, or the Elmer '619 Patent, or the Ford '937 Patent, or any other prior art relied upon by the Examiner is there any explicit or even implicit reason for the prior art combination to render the claimed ranges of both prestress compression and pore size obvious, since none of these references teaches that their disclosed pore sizes lead to a foam glass product strong enough for the purpose of prestress compression within the claimed range. *See* Macedo Declaration, pars. 24-27. The Examiner does not make any contrary contention, nor does he provide an actual evidence that shows reason for such prior art combination.

Nevertheless, the Examiner relies on two cases, *In re Preda*, 401 F.2d 825, 826 (C.C.P.A. 1968), and *In re Sernaker*, 702 F.2d 989, 994-95 (Fed. Cir. 1983), to support the prior art combination. *See* September 11, 2006 Office Action at 11. However, it is respectfully submitted that the Examiner's reliance on these cases is misplaced, even under the flexible and expansive approach recently set forth by the Supreme Court in *Teleflex*. Neither case supports the Examiner's position that a reason to combine the prior art can be found.

The Court of Customs and Patent Appeals in *In re Preda* held that "in considering the disclosure of a reference, it is proper to take into account not only specific teachings of the reference but also the inferences which one skilled in the art would reasonably be expected to draw therefrom." *In re Preda*, 401 F.2d at 826. However, when none of the prior art relied upon by the Examiner discloses or even suggests a prestressed foam glass tile having any amount of prestress compression, let alone the claimed range of 4,000 psi or greater, no one skilled in the art would reasonably be expected to draw from the prior art combination, including the Jones '565 Patent, the Elmer '619 Patent and the Ford '937 Patent, an inference that the claimed ranges of prestress compression and pore size in a prestressed foam glass tile as set forth in the rejected claims would be desirable.

The Examiner also takes the position, citing *In re Sernaker*,[6] that "[t]he strongest rationale for combining references is a recognition, expressly or impliedly in the prior art or drawn from a convincing line of reasoning based on established scientific principles or legal precedent, that some advantage or expected beneficial result would have been produced by their combination." September 11, 2006 Office Action at 11. The Examiner does not, however, explain what specific recognition or technological principle within the knowledge of one of ordinary skill in the art would motivate one with no knowledge

[6] However, the cited portion of *In re Sernaker* does not appear to provide any direct support for the Examiner's statement in support of which he cites the case. Instead, the Federal Circuit in *In re Sernaker* set forth the following tests for obviousness: "(a) whether a combination of the teachings of all or any of the references would have suggested (expressly or by implication) the possibility of achieving further improvement by combining such teachings along the line of the invention in suit, and (b) whether the claimed invention achieved more than a combination which any or all of the prior art references suggested, expressly or by reasonable implication." *In re Sernaker*, 702 F.2d at 994. After finding that the Patent Office Board of Appeals failed these tests, the Federal Circuit held that the Board did not correctly deduce obviousness from the combination of four references. *See id.* at 994-96. Likewise, the Examiner's final rejection based on the prior art combination would fail these tests because of the reasons set forth in this Section of the Appeal Brief.

of the present invention to make the combination of the prior art to obtain a prestressed foam glass tile having both a prestress compression within the claimed range of 4,000 psi or greater and an average pore size within the claimed range of 1.0 mm or less. *See also In re Rouffet*, 149 F.3d at 1357-58 ("Because the Board did not explain the specific understanding or principle within the knowledge of a skilled artisan that would motivate one with no knowledge of [the] invention to make the combination, this court infers that the examiner selected these references with the assistance of hindsight. This court forbids the use of hindsight in the selection of references that comprise the case of obviousness.").

Furthermore, Applicant's disclosure teaches a way in which foam glass tiles having a pore size of less than 1.0 mm are strong enough to have the claimed compression strength prior to prestressing and the claimed prestress compression. At best, the Jones '565 Patent, the Elmer '619 Patent and the Ford '937 Patent, upon which the Examiner also relies, teach that small pores can exist in foam glass materials, but, unlike the present invention, none of them teaches or even suggests that the disclosed pore sizes lead to a foam glass tile strong enough for the purpose of prestress compression within the claimed range. Nowhere in any of the prior art references relied upon by the Examiner is there any teaching or even suggestion that foam glass tiles made with small pore sizes in an appropriate manner can also have the compression and prestress strengths taught and claimed by Applicant in the present application. *See* Macedo Declaration, pars. 24-27. Absent such teachings, a *prima facie* case of obviousness over the rejected claims cannot be established.

For at least these reasons, it is respectfully submitted that independent claims 1, 23, 42 and 54 are in condition for allowance. The dependent claims are also in condition for allowance for the reasons discussed as well as for the additional features they recite. Withdrawal of the rejections of the claims is respectfully requested.

In view of the foregoing remarks, Applicant respectfully requests that a timely Notice of Allowance with respect to all of the pending claims be issued in this case.

The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number 01-1785.

Respectfully submitted,

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